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The Tacit Knowledge in Games: From Validation to Debriefing

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Abstract. Game sessions consist of three phases: briefing, gameplay, and debriefing, with the latter being considered the most important feature of games. Nevertheless, given that games are considered by many to be more of an artistic form rather than a scientific artifact, a question that rises is: Can game sessions in general and debriefing in particular be analyzed and performed in a rigorous scientific way? In other words, can they be consistently structured, given the different characteristics of games, and can clear criteria on what would constitute a successful game session and debriefing be defined? The answer to these questions is yes. Yet, it remains a challenge to extract the knowledge of experts, which resides to a large extent in the tacit knowledge spectrum. Hence, the aim of this paper is to shed some light in this tacit knowledge possessed by experts and to gain understanding on why certain practices are more prone to success than others as well as bring into the surface other practices that have remained well hidden. In order to accomplish this goal, three rounds of interviews were conducted.

Keywords: Gaming simulation · Debriefing · Game sessions · Game validation

1 Introduction

In an era that the complexity of all things around us has dramatically increased, grasping, let alone fully comprehending, that complexity seems to be quite a challenging task. As a result, tools that used to provide insights on how certain parts of the world work a few decades ago in a satisfactory degree, can no longer address the complexity-derived challenges. There is a need for more rigorous methods that would enable the understanding of real-world problems within such an ever-changing complex environment. Gaming simulations (hereinafter referred to as games) is a discipline/method that has the potential to capture the complexity surrounding us and provide for a platform to better understand it. The primary reason is that games incorporate by definition the perpetrator of the aforementioned complexity, humans. Since human behavior cannot be characterized as 100% rational, systems involving

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humans often tend to behave in a seemingly unpredictable way, or what is called bounded rationality [25], hence the complexity and the subsequent challenges.

The complexity of systems, and particularly the complexity of the decision-making process within those systems, can be explored through three levels: technical, actor, and context complexity [19]. Given these three levels, it becomes evident that complexity is not just the result of systems' increased size but is mainly caused by the numerous interdependencies among the different aspects of those systems. In turn, while these interdependencies are abstracted to a certain degree, they still bear a significant amount of complexity, which needs to be translated into game design choices. The result is artifacts, i.e. games for decision making, characterized by numerous and complex structures, which cause many challenges to game researchers and practitioners on how to understand and model them.

The core reason for which humans are interested in studying systems is their seemingly inherent need to understand and control these systems [4]. It is indeed a natural urge, not just out of curiosity, to deeply comprehend how certain systems work, in order to be able to improve them or at the very least adjust our behavior according to their boundaries. As a result, the increased complexity of modern systems, as it has been described so far, requires new methods that would be able to capture and adequately abstract the different elements of systems that cause this inflated complexity. While it seems to be easier said than done, gaming simulations as a discipline appear to possess that toolbox that would allow to tackle and understand complexity.

Therefore, the aim of this paper is initially, in Sect. 2, to debate on the nature of validation in games and particularly on the extent to which validation methods from simulations can be successfully applied in games and on the relationship of game validity to credibility and usability. Then, in Sect. 3, Sect. 4, and Sect. 5, a connection between validity, game sessions and debriefing is established, and results from multiple rounds of interviews of best practices on game sessions and debriefing are presented. Finally, in Sect. 6, final remarks are made.

2 Validation in Games

Before diving into the specifics, it is essential to first define what is validation in games. Adapting Schlesinger et al.'s [24] and Balci's [3] definitions from simulations, validation in games can be defined as the degree to which the game imitates the underline system in a satisfactorily level, or in layman terms game validation addresses the question of whether the game is the "right" one. Yet, Peters et al. [17] argue that the scope of this definition is restrictive and it does not account for more abstract, perhaps even metaphorical, games. They instead adopt a more broad definition, initial proposed by Raser [18], who identified four criteria for the validation of games: psychological reality, structural validity, process validity, and predictive validity. In this thesis, while the importance of a strict definition, which would subsequently clearly provide an acceptability threshold, is acknowledged and supported, the need for a broader understanding of what the validation of games entails is also considered. The aim of this section is therefore not to propose one particular methodology for game validation

but rather to pinpoint that in most cases game validation is not as straightforward as the validation of simulations.

With regards to validity in more broad terms, games can also be seen themselves as a mechanism for validation. Regardless the technology used or the area of application, games have been used as a means to validate certain hypotheses or future scenarios [16]. The concepts of validation and games are therefore intertwined, forming a more complex relationship than initially anticipated. In this thesis and particularly in this part, while several of the games examined have been used for validation purposes, the research is primarily concerned with the validation of games as opposed to how games can be used to validate artifacts or hypotheses.

2.1 From Simulations to Games

Unlike pure simulations, games have a distinct characteristic, which is the human participation, or in other words games have a Game Layer on top of the Simulation Layer. Game validation, due to its nature of including humans, usually depends more on the subjective opinion of experts [12], e.g. questionnaires, than formal methods. This limitation is related to the lack of design methods for games as well as to the usually low number of participants. The latter, i.e. the sample size, plays a significant role on the applicability of game results. A small sample size is easy to obtain but has limited possibilities for analytical conclusions thus limited possibilities for generalizing the observations from the game. A large sample size, while it solves the analytical problem and the generalizability of the results, it is usually expensive to obtain and difficult to coordinate.

Validation of the Simulation Layer has been vastly researched through the course of the last three decades [2, 23], where numerous formal methods and statistical techniques have been introduced. Moreover, methodologies for first verifying that indeed the sample size is small [14], then selecting the most appropriate validation methods and statistical techniques among the numerous existing ones [21], and finally automating validation [22], have been proposed. Though, the real contribution in games that the knowledge acquired from the validation of simulations has to offer is the ability of the validation methods from the simulation field to tackle and potentially address three of the criteria proposed by Raser [18], i.e. structural validity, process validity, and predictive validity.

Validation of the Game Layer due to its nature of including uncertainties pertaining to human activity, usually is not so straightforward. On the one hand, the formalization of game design can provide more structure on game validation. On the other hand, with regards to the sample size, the Game Layer would be benefited only through gradually extending the body of knowledge by building upon previous work. This aspect is directly linked with knowledge management, in the sense that the more game sessions are conducted the more evidences of a system's behavior are discovered and the cumulative sample size gradually becomes large enough to generalize the outcome of the game. Furthermore, it is the Game Layer the one that dictates the need for validating a game also with regards to its psychological reality, which is the degree to which a game provides an environment that seems realistic to the players.

2.2 Validity vs. Credibility and Usability

Apart from validity, two more terms are often associated with a game's successful implementation and application, credibility and usability. Credibility is defined as whether, and the degree to which, key stakeholders in a project consider the game, and subsequently its results, to be correct, always vis vis the particular objectives of the study [13]. While credibility does not conceptually has a 100% correspondence with prediction, this thesis posits that within the scope of games they are strongly correlated, in the sense that if a game has high predictive validity would provide credible results, and vice versa, a game that provides credible results has high predictive validity.

The second term, usability, is defined as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use [8]. Given the nature of the games this thesis is covering, usability is strongly correlated with psychological reality, in the sense that games that aim to imitate a particular system, even in a metaphorical level, tend to be considered realistic when they provide a familiar to the users interface to interact with, which in turn this familiarity is perceived as a more usable artifact.

Given those two terms along with the different kinds of validity, proposed by Raser [18], validation of games should be seen as an extended version of simulation validation, incorporating psychological and user experience factors, as opposed to be seen as mutually exclusive to usability [7]. In that sense, the claim that a game is valid cannot be stated unless it has been established that the game is usable and its results credible, always for its intended purpose of use. In-deed, credibility has been recognized to be a validity criterion [15]. On the other hand, while to the best of our knowledge usability has not been explicitly identified to be a criterion for validity, there have been studies that acknowledge a strong connection between them in general [6] and in games as well [10].

2.3 Overview of Validation

While game validation can be strongly benefited from analytical methods, it cannot solely rely on them since it heavily depends on contextual and behavioral factors. These factors are not in conflict or even separate from validation, as the latter is defined in simulations, but rather complimentary, all of which in this thesis are put under the umbrella of validation in games. Moreover, game validation does not only depend on the game itself but also on how the game is executed. In other words, it depends on the briefing, game session, and debriefing, with particularly the latter being of paramount importance. Validation and game sessions have a reciprocal relationship. Increased validation is more likely to lead to a fruitful and more successful game session, and a successful game session boosts the game outcome and thus further increases its validity. But then the question that rises is: How is a successful game session defined particularly in games for decision making? A question that is further explored in the subsequent sections.

3 1st Round of Interviews: Debriefing Pitfalls

In 2016, a methodology was proposed and subsequently the first round of interviews was conducted for identifying the factors that inhibit debriefing because of problems on the design of the debriefing and for ascertaining whether these pitfalls depend on the different types of games [20]. The interviews included a questionnaire, which was answered by 8 game facilitation experts, and resulted in both quantitative and qualitative results. The answers complemented each other so the quantitative results could be interpreted and placed into the perspective in which an answer was given.

In more detail, the study was initially based on a literature review, from which 12 pitfalls occurring while debriefing games were identified. Then, the facilitation experts categorized the pitfalls based on two criteria: 1. Whether a pitfall occurred due to the design or the execution of the debriefing, and 2. Whether a pitfall occurred mostly in open (free play) or closed (rule based) games [9]. The 12 identified pitfalls can be found in more detail in [20], though briefly these pitfalls are:

1. The debriefers' level of involvement and style is not appropriate.
2. Debriefers have a lack of understanding of the debriefing process, which can lead into providing easy solutions and/or violating the debriefing process. This might occur due to lack of training and/or interest to improve.
3. Lack of plan and/or rules.
4. The allocated time for the debriefing is short and/or the complexity of the simulated scenarios, occurring during the debriefing, may require a repetition of the game, or lead into violating the planned time of the debriefing.
5. Ineffective use of audiovisual (A-V) material, which can lead to interruptions in finding relevant video segments.
6. Lack of emotional safety of the participant, probably revealed because of a. different levels of experience between the participants, b. a difference in education, and c. various other psychological reasons or due to the fact that debriefers might not take into account emotions.
7. Factors related to the actual physical environment, where the debriefing takes place.
8. Choosing the appropriate structure for debriefing.
9. The tendency of the participants to assign blame and antagonize each other.
10. Lack of trust of the participants towards the debriefers.
11. The simulation is not organized in a personal basis, which inhibits the effectiveness of debriefing.
12. Inappropriate timing/scheduling of the debriefing.

As the above list shows, pitfalls while debriefing vary significantly. By no means can this list be deemed complete as it was drawn out of specific contexts, but it was the product of an extensive literature review, and as such, it contains the majority of the most important factors that inhibit debriefing.

From the analysis of the interviews, the most noteworthy conclusions were:

– On the one hand, the pre-defined questions showed that most of the experts consider all pitfalls to be relevant to both closed and open games. On the other hand, the

comments showed that some pitfalls (Pitfalls 1, 3, and 4) are more relevant either to closed or open games. This contradiction can characterize the results, with regards to this categorization, as inconclusive. If pitfalls prove to be independent of the rules of games, they will disprove the initial hypothesis. Thus, it is important and interesting to research this relationship until the point that it would be possible to support or disprove the initial hypothesis with statistical significance.

- Despite the fact that some pitfalls seem to occur mostly due to the design and others due to the execution of the debriefing, all pitfalls had an average of 3.25 or higher on both categories, showing that to some extent, both the design and the execution of the debriefing influence all pitfalls. This result came as a surprise, since it was expected that the pitfalls - or at the very least some of them - were independent either from the design or the execution of the debriefing. Therefore, it will be interesting in the future to validate these results and understand the underlying reason for the above.
- Both the experts that filled the questionnaire, and the ones that did not, reported that they perceive debriefing as a complex event due to the multiple context-and game-related factors it depends on. Nevertheless, their comments gave insight on the relationships among pitfalls and context factors, which in the future can help to model debriefing by abstracting it, the same way a game abstracts a real-world system.
- The personal traits of the facilitators, such as their skills, experience, attitude, style, and overall personality, influence in multiple ways the effectiveness of debriefing. Researching further when, where, and how a facilitator influences debriefing is both important and fascinating, since it introduces new aspects from different scientific fields to the analysis, such as psychology, education, and management.

4 2nd Round of Interviews: Factors Influencing Games' Success

The second round of interviews was conducted in 2018 [1] with 19 experts of which 7 game designers, 6 project leaders, 4 participants, and 2 department managers. The primary tool for analysis was Q-methodology, where the results from the first four interviewees were used to build the q-sort statements, which the remaining 15 interviewees used. Results, showing in Table 1, revealed several factors that either boost or inhibit games' success.

5 3rd Round of Interviews: Defining Successful Debriefing

The third, and final, round of interviews was also conducted in 2018 with 21 game facilitation experts, which was mainly characterized by the contradicting answers in almost all questions. This result translates in a non-unified approach towards games in general and debriefing in particular. The complexity characterizing modern systems immediately excludes pure analytical methods as the absolute and only solution, as the

Table 1. Results from second round of interviews using the Q-methodology.

Factor	Impact	Comments
Presence of a game manager	+	A person that would attend all game-related procedures was found to be beneficial. These procedures involve choosing participants, make these participants available the day of the game, managing missing players, taking care of the space and the infrastructure for the gaming session, to name a few
Managerial guidance and involvement Structured and concrete results	+ +	The involvement of mid/high level managers made the participants feel that what they are doing during the game session matters and it is not just a game. While the limitation of analytical sciences have been pinpointed in this thesis, complete absence of it is also detrimental. Apart from the lack of robust scientific methods for evaluating certain results, the absence of quantifiable results was found to be diminishing the credibility of the game itself
Strict rules	+	Stricter rules were perceived by the interviewees as an insurance of higher validity of results
High variety of roles involved in game design	+	Involvement of stakeholder not just during the game but also during the design process was appreciated by the interviewees, especially from operational personnel
Simulator validated beforehand	+	Not properly validated software has created frustration among the stakeholders and negative opinion about the game overall
Structured debriefing	+	Particularly for games for decision making, an unstructured open discussion after the game was found to often distract from the goal of the game
High complexity of the game's scope	−	Due to time and budget restrictions, over-complex games should be avoided, in order for results to be obtained in an affordable and timely manner. Moreover, often complex environments tend to overwhelm the participants causing the opposite effect from the desired one
Unexpressed and/or conflicting stakeholders' interests	−	Unexpressed interests and expectations were found to severely increase the risk of unanswered research questions and unclear results
Time pressure	−	Time pressure was recognized as a factor that forces untested or not well tested simulators to be used in game session that often causes crashes in the software leading to negative appreciation on behalf of the participants and potentially invalid results

(*continued*)

Table 1. (*continued*)

Factor	Impact	Comments
Pressure from external actors	−	Some stakeholders might put pressure for obtaining results that fit their interests and agenda, which in turn can cause conflicts among all the stakeholders and potentially invalid results

probability for ludic fallacy [26] increases significantly. There-fore, these interviews aim to provide insights on how facilitation experts approach debriefing, hence tap into their tacit knowledge.

The questions these interviews intended to address were:

- Given the limitation of analytical methods to provide clear criteria for success of game sessions, how should success be defined?
- What is the level of knowledge of clients regarding their goal using games and how should they be prepared prior to the game session?
- How do facilitators adapt their approach to the game session based on the players' characteristics?

The first question yielded perhaps the most answers with regards to how experts define success. 21 interviews resulted in more than 10 different answers, confirming the lack of consistency in the field. Nevertheless, three answers were far more common than the others. Freedom and feeling safe to share your experience from the game was considered a factor of paramount importance by six experts. The second most frequent criteria for success was the degree to which players would actually implement in their work, what they have learned during the game. Finally, a factor acknowledged particularly from game designers, that could determine success, was the level of involvement of players and their desire to play the game again.

The first part of the second question was initially expected to be answered overwhelmingly positively, yet more often than not, clients want to build a game but without knowing the actual goals. In the second part of the question, in order for facilitators to manage the varying levels of awareness of clients, the former inform the latter about the possible, unpredictable results of open games, like games for decision making.

The third question relates back to theory, where it was introduced the idea of the interchanging roles that facilitators can, and should, take during a game [11]. The first step for facilitators is to identify any knowledge gap of the players with regards to the game they will participate in. Then, when the participants feel safe enough during the debriefing, the facilitator should capitalize that by taking the conversation into a deeper level. It should be noted that the interviewees acknowledged the influence of particular debriefing methods but none stood out as more effective or preferred.

6 Conclusion

This paper focused on game sessions in general with debriefing having the lion's share. Debriefing is considered to be the most important part of games [5], since its aim is to bridge the abstracted world of games with reality, and thus transfer the acquired knowledge in a real world setting. Nevertheless, debriefing was not the only subject examined; the best practices in conducting game sessions, through a series of interviews with debriefing experts and other game stakeholders, were presented. The results were quite insightful, yet they also indicated several contradictions among experts.

In more detail, a factor that appeared in all three interviews was the participants feeling of safety to play and subsequently express themselves in the debriefing. Safety does not only relate to the emotional safety of an environment, where participants feel that they will not be judged. Safety as a concept also refers to a game environment that is a valid representation of the system under study, thus the participants can contribute the maximum of their capabilities. Moreover, such an environment, enhanced by a structured and appropriate guidance from the facilitator and perhaps a manager, and free from any time or external pressure, was found to be the key to success; a success that was also deemed, intuitively in retrospect, to be heavily depended on the applicability of the game insights and results.

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